REMARKS

Claims 1-36 are pending in this application. Claims 1-36 are rejected. No amendment to the claims has been made herein.

Claims 1-12, 15-21, 23-27 and 28-36 are rejected under 35 U.S.C. §102(b) as being anticipated over USPN 3,956,558 to Blanco et al. (Office action paragraph no. 2)

The rejection of claims 1-12, 15-21, 23-27 and 28-36 is respectfully traversed.

Applicants have previously traversed this rejection (applied to claims 1-13, 15-21, 23-27 and 28-36) in the Amendment dated June 26, 2003, in which Applicants argued that Blanco does not teach any analogue of the recited "intermediate glass layer" and that Blanco's structure is different from that of the present invention.

The Examiner addresses Applicants' arguments traversing the rejection in the Response to Arguments on page 5 of the Office action. In response, the Examiner states:

> "Applicant simply claims an intermediate glass layer and raise color material, which is taught by Blanco. Blanco teaches glass layers applied to design layers at col. 3, lines 25-26, and col. 4, lines 42-46."

That is, the Examiner appears to be stating that Blanco teaches an intermediate glass layer in col. 3, lines 25-26, and col. 4, lines 42-46. Applicants note, however, that column 3, in lines 25-26, discusses "protective barriers of glass **over** the design layer of decalcomanias" (emphasis added). Being **over** the design layer, this cannot meet the limitations of the intermediate glass layer of claim 1, which is **between** the glazing layer and the raised coloring material.

Blanco et al. in column 4, lines 42-46, discloses that a "protective coating ... is deposited **on** the design layer" (emphasis added). Again, this disclosure is structurally inconsistent with the location of the intermediate glass layer of claim 1. Similar arguments apply to claim 18.

In addition, on page 3 at the bottom of the Office action, the Examiner states: "The limitation "in-glaze coloring/decoration" is a process limitation in a product claim." Here, the Examiner apparently disagrees with Applicants' arguments regarding "inglaze" versus "overglaze" ceramic ware made on page 4 of the Amendment of June 26, 2003, in which Applicants stated that "in-glaze decoration" represented a structural limitation.

In support of Applicants' position, Applicants here attach a copy of Rado, "An Introduction to the Technology of Pottery", second edition, Pergamon Press, New York. In section 5, entitled "Fast Firing of In-glaze Decoration", the "in-glaze" decoration is compared schematically in Fig. 8.5 with the traditional on-glaze and under-glaze decorating processes. This Figure and the discussion in the text clearly indicate that the "in-glaze" method results in a distinct structural difference from the on-glaze and under-glaze processes. Therefore, "in-glaze" does represent a structural limitation in the present claims.

Reconsideration of the rejection is therefore respectfully requested.

Claims 13, 14 and 22 are rejected under 35 U.S.C. §103(a) as being unpatentable over USPN 3,956,558 to Blanco et al. in view of USPN 4,892,847 to Reinherz. (Office action paragraph no. 3)

The rejection of claims 13, 14 and 22 is respectfully traversed.

In traversing the rejection, Applicants again argue that Blanco et al. does not provide the "intermediate glass layer" and does not anticipate or suggest the structure recited in base claims 1 and 18.

In the Response to Arguments in the present Office action, the Examiner states "Applicant further contends that Reinherz is not suitable, stating that there is no suggestion to combine the references." However, Applicants respectfully submit that they made **neither** of these arguments. Rather, Applicants stated that there was **no suggestion in Reinherz alone** for the structure recited in the present claims, and Applicants stated that **even if the references were combined, the combination would still fail to meet the limitations** of the claims due to the failure of Blanco et al. to provide the limitations of claims 1 and 18.

Applicants therefore maintain their arguments and respectfully request reconsideration of the rejection.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicants undersigned agent at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicants respectfully petition for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

ARMSTRONG, KRATZ, QUINTOS, HANSON & BROOKS, LLP

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Enclosures: "An introduction to the technology of pottery, Section 5, Fasting Firing of In-glaze decoration"
"Fig. 8.5 Comparison of fast fire in-glaze decoration with on-glaze and under-glaze decoration"

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The Worcester Royal Porcelain Company Ltd.,
Worcester, U.K.

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The use of these thermoplastic inks opened the way to multicolour printing which has enormously increased the potential of the offset printing process.

Metal vs. Photopolymer Design Plates

With the perfection of mechanized printing, a less expensive alternative to the hand engraved copper design plate was sought to reproduce halftone work. With hand engraving, a highly skilled craft, a variety of tones can be reproduced by varying the depth of the cut. Copper is rather soft and in order to provide a harder surface, the copper plate is chromium plated. However, even the chromium plated design plates are insufficiently durable for modern production runs. Longer life is obtained with plates, acid etched in hardened steel.

A further improvement is possible by using an inexpensive plate with a light-sensitive plastic working face (similar to that introduced in the letterpress printing industry), bonded to a metal base for rigidity. The principle on which the plate works is based on the fact that exposure to ultraviolet light polymerizes the plastic, causing it to become permanently hard. The unexposed areas can then be washed away with an appropriate (e.g. alcoholic) solvent, which has no effect on the hardened areas.

A photopolymer plate can be produced once a design is translated into a photographic film. The photopolymer, i.e. photosensitive nylon, gives an etch of excellent resolution, reproducing halftone work and line work accurately. The plates are made to engineering tolerances and are, therefore, ideally suited to automated processing. The photopolymer design plates have the advantage of low cost and high processing speed and, moreover, open up new fields in short-run production which would have been commercially impractical with the expensive hand-cut plate (Basnett, 1980).

4.6. *Computerized Decoration*

An Italian firm has put on the market a computer controlled painting machine "Plotex 3" (see Fig. 8.4). It is capable of painting with five different colours, of spraying, with or without stencils, and of engraving patterns into the dried glaze coat. The machine is controlled and programmed by a computer the modules of which reproduce the different movements. This decorating unit can be incorporated in all production lines (Luchs, 1985).

5. Fast Firing of In-glaze Decoration

Normal on-glaze decoration is fired as low as 750–820°C.

The application of decoration to the fired glaze, followed by fast firing to temperatures high enough for the colours to sink into the softening glaze, has already been dealt with under section 6.3.3, "Making Decoration Dish-

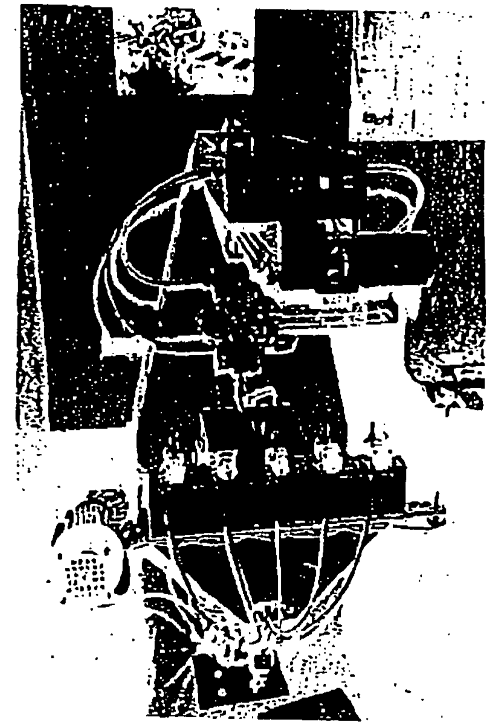

FIG. 8.4. Computer-controlled painting machine "Plotex 3" by Palladini and Giovanardi. Reproduced by permission of Verlag Schmid GmbH.

washer-proof" in Chapter 6 (p. 120). This relatively new method, known as "*in-glaze*" decoration, is compared schematically in Fig. 8.5 with the traditional on-glaze and under-glaze decorating processes, showing the differences between hard porcelain on the one hand and bone china, vitrified hotelware, earthenware, etc., on the other hand. The purpose of rapid firing of in-glaze decoration is reiterated, viz. to reduce firing costs, and to make a larger palette of colours durable.

It is unlikely that the rapid decorating firing schedules of 60–90 minutes, as used for hard porcelain, will be applied to earthenware (Bull, 1982). To compensate for the short duration of firing, the maximum temperature has to be increased. The higher peak temperature causes a fault in the porous earthenware, known as "*spit-out*"; this consists of numerous small craters in the glaze, brought about by desorption of previously adsorbed water vapour.

The fast firing of decoration on bone china and other vitreous bodies has proved successful. The widest application is with hard porcelain; 80 per cent of tableware decoration on hard porcelain in Germany, was *fast* fired in 1985 (Pfaff, 1985).

A strongly oxidizing atmosphere is required in the early stages of fast firing

in-glaze decoration (200–500°C) in order to burn out the resins. Butylmethacrylate polymers, generally used in ceramic transfers, have excellent burn-out properties (Bull, 1982).

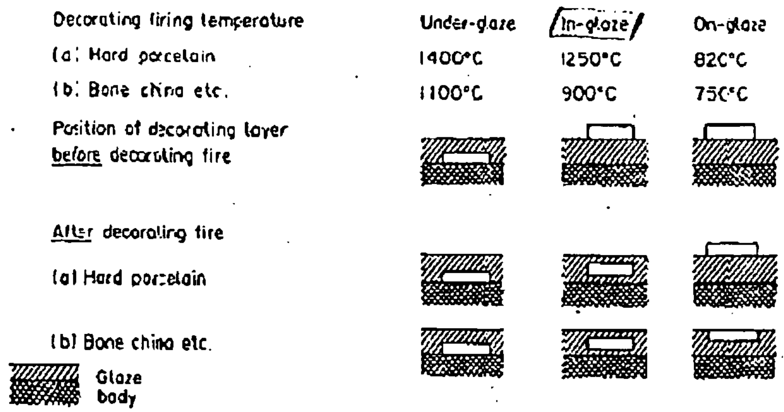

FIG. 8.5. Comparison of fast fire in-glaze decoration with on-glaze and under-glaze decoration.

When the temperature is high enough for the fluxes to melt, the pigments become embedded in the glassy layer formed. The highly mobile ions of alkali, alkaline earths, also boron, lead and zinc oxides of the glassy layer, diffuse into the glaze. With hard porcelain the ion exchange thus brought about results in very highly resistant colours (Pfaff, 1973).

There is no denying that fast firing of up to 1280°C has resulted in a widening of the available colour palette for those temperatures; however, they are too high for certain colours, such as the cadmium/selenium reds. For this reason a new type of colour stain has been developed for medium temperature in-glaze fast firing of hard porcelain, i.e. 900–1000°C, extending to practically the whole range of on-glaze colours. These new stains do not only cover an extended palette but are also more brilliant. Despite the lower temperature, they still sink into the glaze and are claimed to be equal to the high temperature fast fire in-glaze stains in respect of chemical durability. The glaze is still highly viscous at the maximum temperature of the medium fast fire stains, so that no air bubbles are formed, the glaze surface remaining perfect; with high temperature fast fire in-glaze colours there is a danger of pin-holes being formed in the glaze (Pfaff, 1985).

Special burnished gold preparations have been developed for firing with the medium temperature fast fire stains. The gold does not actually sink into the glaze, otherwise it could not be burnished and would remain dull. (Golds have, nevertheless, been prepared for high-temperature fast firing (Anon., 1975—German patent 2 208 915).)

The question has arisen as to how the body would stand up to the drastic thermal shock in the fast heating and cooling of fast fire for decor Thick-walled hard porcelain articles tended to show cracks after exceed fast speeds of firing; prolonging the firing time eliminated this fault. investigating any possible changes in body properties arising from fast f it was found that a certain improvement in the mechanical strength of porcelain was achieved; this could be the result of a tempering acti observed with tempered glass.

Regarding pottery, such as bone china, having a thermal shock resis inferior to hard porcelain, no insuperable difficulties were experienced fast firing of decoration. Where cracking did occur, a relatively adjustment in the firing time overcame the fault.

Further Reading

General: Shaw (1968); Singer and Singer (1963, pp. 797–831).
Atomic basis of colour: Dinsdale (1986, p. 184).
Formation of ceramic colours: Shaw (1966); Taylor (1967); Singer and Singer (1963, p 235).
Colouring agents: Singer and Singer (1963, pp. 616–643); Wolf (1937).
The chemistry of zirconium silicate pigments: Batchelor (1974).
Coloured glazes: Mattke (1984).
Factors affecting lithography: Scherez (1979).
Mechanized and automated decoration:
Banding machines; Ellis (1973); Alt (1972)
Printing machines; Roberts (1981/4, 1981/5); Alt (1971); Luchs (1985); Basnett (198
Fast firing of decoration: Bull (1982); Pfaff (1973, 1985); Schüller and others (1977) (1975); Hauschild (1978).

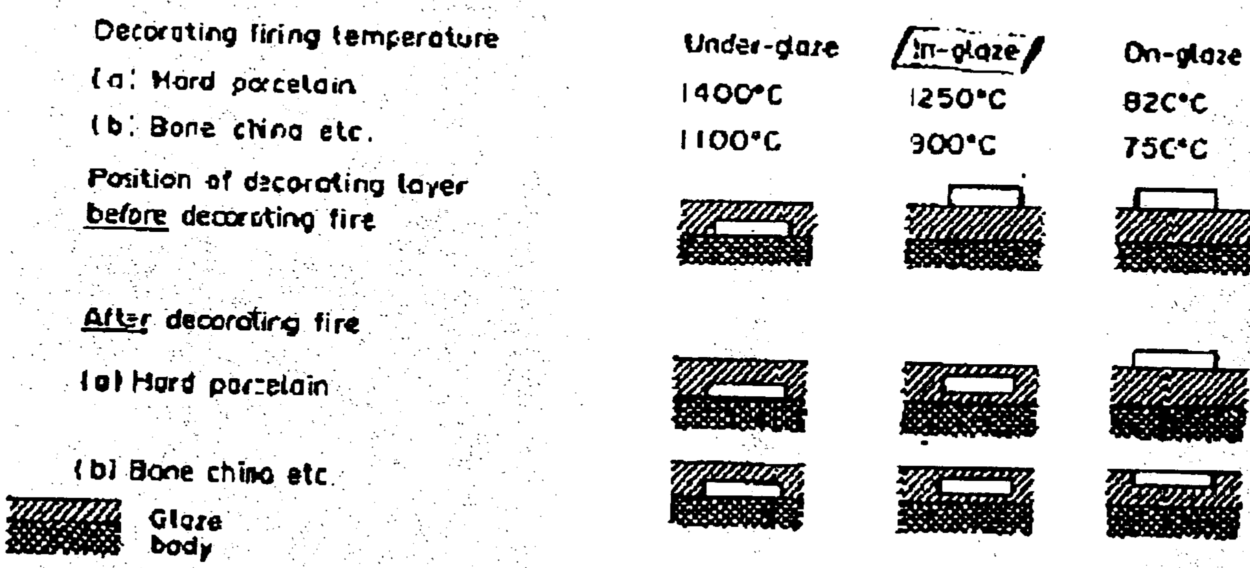

FIG. 8.5. Comparison of fast fire in-glaze decoration with on-glaze and under-glaze decoration.